Serial No.: 10/516,527
Atty. Docket No.: P67953US1

IN THE CLAIMS:

Please amend the claims as follows:

1. (Original) An optical branching unit (1) formed on a substrate, the optical branching unit comprising waveguides for guiding light at a predetermined wavelength λ, the waveguides comprising a core region having a refractive index n_{core}, the core region being embedded in a cladding (6) having a refractive index n_{clad}, the waveguides comprising an input waveguide with an input core region (2) of width w_{in} and at least two output waveguides having output core regions (301, 302) of widths $w_{out,i}$, a branching part (4) - having a refractive index n_{core} - for connecting the input and output waveguide cores, a splitting region (7) adjacent to the branching part, the width of the branching part being substantially equal to w_{in} at its joint with the input waveguide core and to the sum of the widths $w_{out,i}$ at its joint with the output waveguide cores, the width of the branching part gradually expanding from its joint with the input waveguide core to allow the output waveguide cores to be branched off and diverge from each other in the splitting region wherein a multitude of M transversal waveguide core elements (5; 501, 502, 503, 504, 505, 506, 507, 508, 509, 510) each having a width w_i, a refractive index $n_{trans,i}$ and being embedded

in said cladding are located in the splitting region forming paths with a mutual centre to centre distance of s_i, said transversal waveguide core elements fully or partially connecting neighbouring output waveguide cores.

2. (Original) An optical branching unit according to claim 1 wherein opposing edges of neighbouring diverging output waveguide cores meet at the joint with the branching part in a fork or Y-type structure.

3. (Original) An optical branching unit according to claim 1 wherein said branching part comprises a tapered part joining the input and output waveguide cores, the width of the tapered part being substantially equal to w_{in} at its joint with the input waveguide core and to the sum of the widths $w_{out,i}$ at its joint with the output waveguide cores, and an abutting region, the output waveguide core regions being aligned with and extending from said tapered region and abutting each other in the abutting region.

4. (Previously Presented) An optical branching unit according to claim 1 wherein the optical branching unit has 1 input and 2 output waveguides.

5. (Previously Presented) An optical branching unit according to claim 1 wherein the width w_i of the transversal waveguide core elements decreases with increasing i as the output waveguide cores diverge.

6. (Previously Presented) An optical branching unit according to claim 1 wherein the centre to centre distance s_i between the i'th and the (i+1)'th transversal waveguide core element increases with increasing i as the output waveguide cores diverge or run in parallel.

7. (Previously Presented) An optical branching unit according to claim 1 wherein the transversal waveguide core elements run substantially mutually parallel and perpendicular to the output direction of the optical branching unit.

8. (Previously Presented) An optical branching unit according to claim 1, wherein at least one and preferably all of the transversal waveguide core elements form an uninterrupted path between two neighbouring output waveguide cores.

9. (Previously Presented) An optical branching unit according to claim 1 wherein the cladding (6) comprises lower (61) and upper (62) cladding layers, the core region (301) of a waveguide being formed in a layer applied to the lower cladding layer (61) supported by the substrate (10) and the upper cladding layer (62) being applied to cover the core region (301) and the lower cladding layer (61).

10. (Original) An optical branching unit according to claim 9 wherein the upper cladding layer (62) comprises boron and/or phosphorus doped silica glass deposited by plasma enhanced chemical vapour deposition as a succession of individually annealed layers.

11. (Currently Amended) An optical component comprising a combination of planar waveguides on a substrate, each waveguide ~~comprising~~ having a core region pattern surrounded by lower and upper cladding layers, the core region pattern being formed in a layer applied to the lower cladding layer supported by the substrate and the upper cladding layer being applied to cover the core region pattern and the lower cladding layer, the combination of waveguides ~~comprising~~ including spaced, parallel, diverging or merging waveguide core sections, and a void reducing or stress

reducing structural element ~~wherein said component comprises a stress relieving element~~ located in the vicinity of said spaced, parallel, diverging or merging waveguide core sections.

12. (Currently Amended) ~~An~~ The optical component as claimed in claim 11 wherein said structural element includes a stress relieving element ~~or elements is/are made of the same material and in the same process step as the core region patterns~~.

13. (Currently Amended) ~~An~~ The optical component as claimed in claim ~~11~~ 12 wherein ~~the~~ a minimum distance between a first waveguide and ~~a~~ said stress relieving element is smaller than three times ~~the~~ a height of ~~the~~ said first waveguide ~~in question, such as smaller than twice the height, such as smaller than the height of the waveguide in question~~.

14. (Currently Amended) ~~An~~ The optical component as claimed in claim ~~11~~ 12 wherein ~~a~~ said stress relieving element is elongate and has a width that is less than or equal to ~~the~~ a width of ~~the~~ a nearest waveguide.

15. (Currently Amended) ~~An~~ The optical component as claimed in claim 11 ~~comprising several~~ wherein said structural element includes a plurality of parallel running stress relieving elements.

16. (Currently Amended) ~~An~~ The optical component as claimed in claim 15 wherein ~~the~~ a distance between neighbouring stress relieving elements is less than 15 µm~~, such as less than 10 µm, such as less than 5 µm~~.

17. (Currently Amended) ~~An~~ The optical component as claimed in claim ~~11~~ 12 wherein ~~a~~ said stress relieving element has width dimensions that are larger than ~~the~~ a nearest waveguide.

18. (Currently Amended) ~~An~~ The optical component as claimed in claim 17 wherein ~~a~~ said stress relieving element has a form that substantially matches the space between two merging or diverging waveguide core sections.

19. (Currently Amended) ~~An~~ The optical component as claimed in claim ~~11 comprising~~ 12 wherein said component is a branching element ~~such as a coupler or a splitter~~.

20. (Currently Amended) ~~An~~ The optical component as claimed in claim 12 ~~11 wherein the optical component~~ further ~~comprises~~ comprising transversal elements formed in the waveguide core layer and connecting spaced, parallel, diverging or merging waveguide core sections.

Claims 21-30. (Canceled).

31. (Currently Amended) ~~An~~ The optical component as claimed in claim 11 ~~comprising a combination of planar waveguides on a substrate, each waveguide comprising a core region pattern surrounded by lower and upper cladding layers, the core region pattern being formed in a layer applied to the lower cladding layer supported by the substrate and the upper cladding layer being applied to cover the core region pattern and the lower cladding layer, the combination of waveguides comprising spaced, parallel, diverging or merging waveguide core sections wherein said spaced, parallel, diverging or merging waveguide sections comprise~~ wherein said structural element includes segmented sections ~~comprising~~ having a number of separate waveguide core pieces.

32. (Currently Amended) ~~An~~ The optical component as claimed in claim 31 ~~comprising~~ wherein two spaced waveguide sections form ~~forming~~ part of an optical coupler ~~wherein~~ with said waveguide core pieces ~~are~~ being essentially formed as parallelograms when viewed in a planar cross section.

33. (Currently Amended) ~~An~~ The optical component as claimed in claim 31 comprising two spaced substantially parallel waveguide sections wherein ~~the~~ cross sections of the two waveguide sections when viewed in a planar cross section are mirror symmetric around an axis midway between the centre axes of the two waveguide sections.

34. (Currently Amended) ~~An~~ The optical component as claimed in claim 31 wherein ~~the~~ spacing between each waveguide segment in a direction of intended light transmission of a waveguide section is identical for all segments.

35. (Currently Amended) ~~An~~ The optical component as claimed in claim 32 wherein ~~the~~ an angle of a parallelogram $90^\circ + \alpha$ defining a waveguide piece as defined by an edge of one waveguide section facing the other waveguide section and the first edge

encountered by light propagated in the intended direction of light transmission is larger than 90°.

36. (Currently Amended) ~~An~~ The optical component as claimed in claim 35 wherein the angle α is around 8°.

37. (Currently Amended) ~~An~~ The optical component as claimed in claim 31 further comprising transversal waveguide core elements between segmented waveguide sections.

38. (Currently Amended) ~~An~~ The optical component as claimed in claim 37 wherein the transversal waveguide core elements of a waveguide section are angled compared to an intended direction of light transmission of the waveguide section.

39. (Currently Amended) ~~An~~ The optical component as claimed in claim 38 wherein the transversal waveguide elements meet ~~the~~ corresponding waveguide segments at an angle substantially equal to $90-\alpha$.

40. (Currently Amended) ~~An~~ The optical component as claimed in claim 37 wherein the transversal waveguide elements are segmented.

41. (Currently Amended) ~~An~~ The optical component as claimed in claim 11 wherein said component is a coupler ~~comprising a combination of planar waveguides on a substrate, each waveguide comprising a core region pattern surrounded by lower and upper cladding layers, the core region pattern being formed in a layer applied to the lower cladding layer supported by the substrate and the upper cladding layer being applied to cover the core region pattern and the lower cladding layer,~~ and the combination of waveguides ~~comprising~~ includes a length of at least two spaced waveguide core sections, said structural element including ~~wherein~~ transversal elements ~~are~~ arranged between said spaced waveguide core sections, said two ~~waveguides~~ waveguide sections having, [[-]] over a certain length, [[-]] substantially parallel sections ~~of waveguides~~ that diverge from each other at both ends of the parallel sections.

42. (Currently Amended) ~~An~~ The optical ~~coupler~~ component as claimed in claim 41 wherein ~~comprising~~ two spaced waveguide

sections are substantially parallel ~~waveguide sections wherein the~~ with cross sections of the two waveguide sections and connecting transversal elements, when viewed in a planar cross section, being ~~are~~ mirror symmetric around an axis midway between the centre axes of the two waveguide sections.

43. (Currently Amended) ~~An~~ The optical ~~coupler~~ component as claimed in claim 42 wherein the transversal ~~waveguide core~~ elements of a waveguide section are angled compared to an intended direction of light transmission of the waveguide section to minimize back-reflections.

44. (Currently Amended) ~~An~~ The optical ~~coupler~~ component as claimed in claim 43 wherein said spaced waveguide core sections are segmented, each ~~comprising~~ having a number of waveguide core pieces separated by a space filled with upper cladding material.

45. (Currently Amended) A method of manufacturing an optical component ~~according to claim 1 comprising~~ having a combination of planar waveguides on a substrate, each waveguide having a core region pattern surrounded by lower and upper cladding layers, the core region pattern being formed in a layer applied to the lower

cladding layer supported by the substrate and the upper cladding layer being applied to cover the core region pattern and the lower cladding layer, the combination of waveguides including spaced, parallel, diverging or merging waveguide core sections, and void reducing or stress reducing structural elements being located in the vicinity of said spaced, parallel, diverging or merging waveguide core sections, said waveguide core sections forming a core region layout in a planar view, the method comprising the steps of:

a) providing a substrate[[,]];

b) forming a lower cladding layer on the substrate[[,]];

c) forming a core layer on the lower cladding layer[[,]];

d) providing a core mask comprising a core pattern corresponding to the core region layout and a layout of said structural ~~transversal~~ elements~~, the transversal elements extending between at least two~~ in the vicinity of said spaced, parallel, diverging or merging waveguide core sections~~, thereby fully or partially connecting them,~~;

e) forming core sections and ~~transversal~~ structural elements using said core mask, a photolithographic and an etching process[[,]]; and

f) forming an upper cladding layer to cover the waveguide core sections, the ~~transversal~~ structural elements and the lower cladding layer ~~wherein at least one of the steps b), c), f) is performed by plasma enhanced chemical vapour deposition~~.

46. (Currently Amended) ~~A~~ The method as claimed in claim 45 wherein the step of providing a substrate ~~is~~ includes providing a silicon substrate, and the core and cladding layers ~~comprise~~ include silica glass.

47. (Currently Amended) ~~A~~ The method as claimed in claim 45 wherein the step of forming an upper cladding layer ~~has~~ includes forming an upper cladding layer having a lower flow temperature than that of the core and the lower cladding layer.

48. (Currently Amended) ~~A~~ The method method as claimed in claim 47 wherein the upper cladding layer ~~comprises~~ is formed including boron and/or phosphorus.

49. (Currently Amended) ~~A~~ The method as claimed in claim 45 wherein ~~all~~ at least some of the layers on the substrate are formed by plasma enhanced chemical vapour deposition.

50. (Currently Amended) ~~A~~ The method as claimed in claim 47 wherein step f) ~~comprises~~ includes successive deposition and annealing steps.

51. (Currently Amended) ~~A~~ The method as claimed in claim 45 wherein step e) includes forming said ~~the waveguide~~ core sections and structural elements that include transversal elements that extend between at least two of said spaced, parallel, diverging or merging waveguide core sections so that said at least two core sections ~~that~~ are fully or partially connected by said transversal elements ~~form part of a coupler or a splitter~~.

52. (Currently Amended) ~~A~~ The method as claimed in claim 51 wherein the waveguide core sections that are fully or partially connected by transversal elements are formed to run essentially parallel over a certain length of the waveguides.

53. (Currently Amended) ~~A~~ The method as claimed in claim 51 wherein the waveguide core sections that are fully or partially connected by transversal elements are formed to essentially diverge from each other over a certain length of the waveguides.

54. (Currently Amended) ~~A~~ The method as claimed in claim ~~1~~ 51 wherein at least one of the transversal elements is formed to fully ~~connects~~ connect two waveguide core sections.

55. (New) The method as claimed in claim 45 wherein step e) includes forming said core sections and structural elements that include stress relieving elements in the vicinity of said spaced, parallel, diverging or merging waveguide core sections.

56. (New) The method as claimed in claim 55 wherein a flow temperature of the upper cladding layer is adapted so that the waveguide core sections do not flow during an annealing that flows the upper cladding layer.

57. (New) The optical component as claimed in claim 19 wherein said branching element is a coupler or a splitter.

58. (New) The optical component as claimed in claim 12 wherein said stress relieving element is made of the same material and in the same process step as the core region patterns.

59. (New) The optical component as claimed in claim 12 wherein a minimum distance between a first waveguide and said stress relieving element is smaller than twice a height of said first waveguide.

60. (New) The optical component as claimed in claim 12 wherein a minimum distance between a first waveguide and said stress relieving element is smaller than a height of said first waveguide.

61. (New) The optical component as claimed in claim 15 wherein a distance between neighbouring stress relieving elements is less than 10 μm.

62. (New) The optical component as claimed in claim 15 wherein a distance between neighbouring stress relieving elements is less than 5 μm.